

Substances found to have polymorphic binding proteins can then be subject to the following series of observations:

1) Tests on families scored for other markers which have already been collected in other laboratories. Prospective collaborations are being considered. It is expected (but should be first tested) that in serum stored in freezers the specific binding activity is stable. The existence of a number of projects in which blood samples have been collected from families, examined and stored makes it easier and more efficient to test on such material inheritance of the protein differences (i.e. segregation analysis) and linkage of the corresponding genes to standard markers. Several such collections of samples are already available.

2) We plan to examine newborn infants born at Stanford Hospital of matings in which the mother is homozygous for a polymorphic protein of the type described, and the father heterozygous (or homozygous for another allele). The paternal protein would be searched in cord blood and if not present, the child would be followed further to establish the age of appearance of the paternal protein. This would give us a chance to seek regulatory genes for the developmental pattern of these proteins. For instance, we will seek variation among individuals of age of appearance of the protein and analyze the variation with family studies.

3) For every specific substance, patients with diseases that may be explained by a variation or absence of a binding protein, the specific substance should be examined.

#### D. SIGNIFICANCE

It is difficult to anticipate the total number of proteins that can be identified by this procedure, but existing information would suggest that it can be as high as several hundred. The method suggested then supplies a very economical procedure for testing a great number of potential polymorphisms. The frequency of polymorphic genes is one of the quantities which is of interest to estimate for comparison with the existing enzyme data. This result has obvious evolutionary significance in view of the present discussion on neutrality of polymorphic genes. If the proportion is the same as is known to be among enzymes, then this investigation may generate enough markers to more than double the existing genetic map of man, with all consequent advantages of increased precision in genetic counseling and research.

The interest offered by such new polymorphisms would be greatly enhanced by the possibility of detecting variation for regulatory genes in the manner explained before. This is one of the most difficult fields in human general genetics today, the development of which may be most fruitful.

Finally, each and every one of the proteins thus detected and identified may offer unique possibilities of further research and therapeutic developments. Taking again the model of transferrin, there is one well known case of congenital absence of this protein which was lethal (Heilmeyer et al., 1961). In similar cases, substitutional therapy by transfusion or plasma infusions may prove life saving. Several dangerous rare drug idiosyncrasies are known to exist, e.g. to chloramphenicol. Should they prove to be connected to the lack of a specific binding protein, transfusion or plasma infusions may again prove useful or at least these patients could be identified before becoming the victims of the administration of a drug potentially lethal for them. Cases of vitamin or hormone resistance might find similarly an unexpected explanation and therapeutic benefit.

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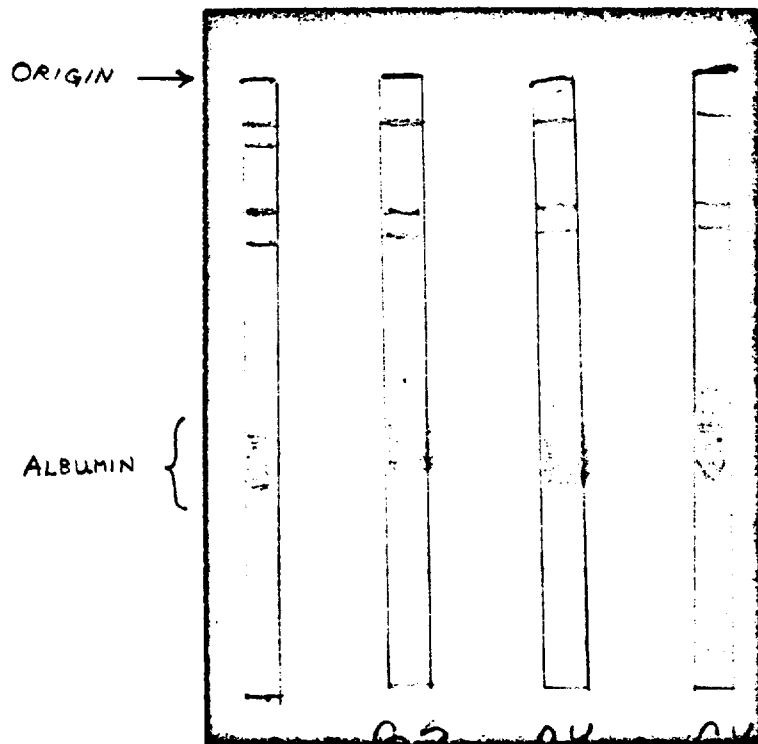


FIGURE 1

SUBSTITUTE DETAILED BUDGET FOR FIRST 12-MONTH PERIOD		PERIOD COVERED		GRANT NUMBER
		FROM 1/1/74	THROUGH 12/31/74	
1. PERSONNEL (List all personnel engaged on project)		TIME OR EFFORT %/HRS.	AMOUNT REQUESTED (Omit cents)	
NAME (Last, first, initial)	TITLE OF POSITION		TOTAL	
Cavalli, Sforza, L.	Principal Investigator or Program Director	10%	POLYMORPHISMS OF SPECIFIC BINDING PROTEINS	
Open - Genetics	Research Associate	100%		
Open - Genetics	Research Tech.	100%		
TOTAL			\$ 30,489	
2. CONSULTANT COSTS (Include Fees and Travel)			\$	
3. EQUIPMENT (Itemize)			\$	
Constant current power supply \$1,000				
Slab gel electrophoresis 300				
Column acrylamide gel electrophor. 200				
Destainer 200			\$ 1,700*	
4. SUPPLIES			\$	
Radioactive tracers \$5,000				
Chemicals, glassware, lab app. 1,000				
Expendable lab supplies, 1,500 (photographic supplies, etc.)			\$ 7,500	
5. STAFF TRAVEL (See Instructions)			\$	
a. DOMESTIC 2 East coast meetings			\$ 1,000	
b. FOREIGN			\$	
6. PATIENT COSTS (Separate Inpatient and Outpatient)			\$	
Venapuncture for blood samples			\$ 500	
7. ALTERATIONS AND RENOVATIONS			\$	
8. OTHER EXPENSES (Itemize per Instructions)			\$	
Office supplies, telephone, repro., postage, publications costs, etc. 1000				
Central computer usage 1000			\$ 2,000	
9. Subtotal - Items 1 thru 8			\$ 43,189	
FOR TRAINING GRANTS ONLY	10. TRAINEE EXPENSES (See Instructions)		\$	
	a. STIPENDS	PREDOCTORAL No. Proposed _____	\$	
		POSTDOCTORAL No. Proposed _____	\$	
		OTHER (Specify) No. Proposed _____	\$	
		DEPENDENCY ALLOWANCE	\$	
	TOTAL STIPEND EXPENSES		\$	
	b. TUITION AND FEES		\$	
c. TRAINEE TRAVEL (Describe)		\$		
11. Subtotal - Trainee Expenses		\$		
12. TOTAL DIRECT COST (Add Subtotals, Items 9 and 11, and enter on Page 1)			\$ 43,189	

**BUDGET ESTIMATES FOR ALL YEARS OF SUPPORT REQUESTED FROM PUBLIC HEALTH SERVICE  
DIRECT COSTS ONLY (Omit Cents)**

DESCRIPTION		1ST PERIOD (SAME AS DE- TAILED BUDGET)	ADDITIONAL YEARS SUPPORT REQUESTED <i>(This application only)</i>					
			2ND YEAR	3RD YEAR	4TH YEAR	5TH YEAR	6TH YEAR	7TH YEAR
PERSONNEL COSTS		30,489	32,648	34,898	37,301	39,867		
CONSULTANT COSTS <i>(Include fees, travel, etc.)</i>								
EQUIPMENT		1,700*	500*	500*				
SUPPLIES		7,500	8,000	8,600	9,000	9,600		
TRAVEL	DOMESTIC	1,000	1,100	1,200	1,200	1,300		
	FOREIGN							
PATIENT COSTS		500	500	500	500	500		
ALTERATIONS AND RENOVATIONS								
OTHER EXPENSES		2,000	2,300	2,400	2,400	2,700		
TOTAL DIRECT COSTS		43,189	45,048	48,098	50,401	53,967		
TOTAL FOR ENTIRE PROPOSED PROJECT PERIOD <i>(Enter on Page 1, Item 4)</i> →						\$ 240,703		

REMARKS: *Justify all costs for the first year for which the need may not be obvious. For future years, justify equipment costs, as well as any significant increases in any other category. If a recurring annual increase in personnel costs is requested, give percentage. (Use continuation page if needed.)*

Budget explanation attached

## BUDGET EXPLANATION

10% of Professor Cavalli-Sforza's time along with a full-time Research Associate and a full-time Research Technician are budgetted in support of this project. The Research Associate, a biochemical geneticist, will be responsible for the electrophoretic analysis of plasma proteins and will be assisted by the Research Technician.

Salaries are increased at a rate of 6% per year to cover merit and cost of living increases. Staff benefits are applied based on the following University projections: 17%, 9/73-8/74; 18.3%, 9/74-8/75; 19.3%, 9/75-8/76; 20.3%, 9/76-8/77; 21.3%, 9/77-8/78; and 22.3%, 9/78-8/79.

The budget includes slab gel and column gel electrophoresis equipment, and associated power supply, etc., as well as supporting supplies. These supplies include radioactive tracers, chemicals and laboratory apparatus, glassware, and expendable supplies such as photographic plates, etc.

Travel funds are requested for attending two professional meetings on the east coast.

Patient costs covering venepuncture to obtain blood samples, are estimated at \$500 per year.

SECTION VI

The Impact of Genetic Counseling Practices on  
Family Decisions and Behavior

Drs. Barnett, Cann, and Luzzatti



# The Impact of Genetic Counseling Practices on Family Decisions and Behavior

Dr. C.R. Barnett, Principal Investigator  
Drs. H. Cann and L. Luzzatti, Associate Investigators

## A. INTRODUCTION

### A.1 Objectives

The overall objective of this study is to provide systematic answers to some of the basic, unanswered questions in the practice of genetic counseling. (1) What is the impact of genetic counseling, that is, do families not receiving genetic counseling make decisions different from those who do? (2) What is the difference in counseling effectiveness between a physician trained in genetic counseling and a social worker trained in genetics? (3) What is the difference in effectiveness between a counselor who is directive in his counseling and one who maintains a neutral stance? (4) What is the relationship between the structure and content of a genetic counseling session and the pre-counseling training and attitude of the counselor? (5) What is the difference in effectiveness between a counselor who receives social and psychological information about the family before counseling and one who does not have such information? (6) What are the expectations of families seeking counseling and how do they use the information they obtain in making decisions?

### A.2 Background

A recent review of the social aspects of human genetics (1) and an editorial on genetic counseling in the New England Journal of Medicine (2) have consisted largely of lists of questions regarding genetic counseling for which there are as yet no answers. While much has been learned over the years regarding the genetic basis for many diseases, their mode of inheritance and the probability of occurrence in a given population, little research attention has been paid to how this information is transmitted to patients and the use they make of it. Typical of the state of the art and the still prevailing emphasis on "genetic prognosis", rather than "genetic counseling", is a recent textbook on genetic counseling (3) which devotes only 3 of its 355 pages to the counselor-patient relationship.

The major issues in the field may be subsumed under three basic questions: 1) What is or should be the impact of counseling? 2) What should be the counselor's role? 3) Who should do the counseling?

The first question is most difficult to answer at this time since there are little data available on the impact of counseling. A few studies have looked at impact by measuring the number of children families have had post-counseling, or by learning of their post-counseling decision to practice or change

their methods of contraception. With regard to the findings from such studies, Hecht and Holmes (2) have noted: "What is the objective of genetic counseling? If it is to lessen the chance of subsequent affected sibs being born, the available data are discouraging." One of the major problems with studies which have reported somewhat favorable results (4) is that they have not utilized control groups. The only study that used a control group (made up of families with children affected with a non-genetic, chronic condition) reported that 50% of the control group decided to limit the size of their families, in the absence of any genetic counseling to do so (5). Studies to measure the effects of counseling have also used a number of other outcome criteria, such as knowledge of probability or risk and information about hereditary transmission of traits that was retained by the family. There are two major deficiencies in these studies. First, with one exception (6) none of the studies have made an assessment of knowledge before the counseling took place. Indeed, in some cases, the follow-up of knowledge retained by the families was as long as 4 to 10 years after counseling (4,7), with no control or assessment of the effect of other sources of information on the families.

A second deficiency with the studies which have tested post-counseling risk and genetic knowledge of families, is that there is no indication, from the point of view of families, that biological knowledge and information regarding risk is used by them in making decisions about reproduction. The actual decision-making process in the family has remained an unopened "black box".

The second question regarding the counselor's role involves sharp differences of opinion on two issues: the question of whether the counselor should be neutral or directive; and whether the counseling should be narrowly focused or broadly comprehensive. The traditional neutral stance is most often associated with the focused role prescribed for the counselor: "It can be argued that a counselor's job is simply to estimate....risk as well as possible and try to ensure that this is understood. This is, of course, true. It is entirely a matter for parents to decide whether to avoid having further children, or to seek sterilization or termination of pregnancy" (3). When a genetic counselor feels called upon to violate this principle of neutrality, he makes a point of explaining the deviation, as does Carter (4), in order to reassure low risk parents. There are two untested assumptions in the argument presented by experts on both sides of this controversy. The first assumption is that a neutral counselor will not communicate unconsciously by his tone of voice, mode of presentation or non-verbal cues, his true feelings about what decision a family should make. Secondly, it is assumed that presentation of his feelings of "what he would do if he were in their shoes" will have a marked effect on the family's decision. These assumptions can and should be tested, since findings may suggest that the argument for either position is irrelevant to the outcome of counseling.

The issue of whether genetic counseling should be narrowly focused or broadly comprehensive has been linked to the question of who should do the counseling. Thus those who have taken the position that genetic counseling should be considered part of family guidance, have argued that the family physician can best play this role (8). Those who argue that the primary purpose of genetic counseling is to answer questions the patient may have about risk, feel that counseling should be left to the clinical geneticist. Franz Kallman (9), who favors a comprehensive approach has phrased the question most realistically by suggesting the type of training needed by the counselor: "There can be no question....that the constructive management of genetic family problems requires either geneticists who are experienced in counseling techniques or family guidance workers who have adequate training in genetics".

The issue of whether to take a narrow or a broad approach to counseling could be settled if information were available regarding what problems they may acquire as a result of the counseling. At present, genetic counseling has been not subject to the same types of analysis that have been brought to bear on the physician-patient relationship in other situations (10). Thus, what happens during genetic counseling has been described only in anecdotal form (1).

The question of whether the geneticist, the family counselor, the family physician or any other type of professional or lay counselor can best meet the needs of the family seeking genetic counseling can be determined by systematic evaluation of what these people actually do in counseling and what impact they have on the families. When new roles have been established in other areas of care delivery, the behavior and effectiveness of people taking the new roles have been evaluated (11). There is no reason why the same approach cannot be taken with regard to this issue in genetic counseling.

### A.3 Rationale

Genetic counseling involves at least two parties, the counselor and the family, and both parties to the event must be studied, as well as the event (counseling) itself to determine the effectiveness of genetic counseling under varying conditions.

The counselor will bring to counseling his expectations about the nature of the counseling situation, and a predetermined view of the risk and burden a defect may represent for the family. He may decide, beforehand, to communicate an optimistic, pessimistic or neutral point of view to the family. His "public" position may vary from his "privately" held view. He may, if he is supplied with additional information about the family, (their state of knowledge, their values regarding having children, differences between husband and wife on basic issues, other decisions they are in the process of making, and their expectations regarding counseling), tailor the information and counseling he provides to the specific needs of the family.

The family, as noted above, may have expectations regarding counseling that are at variance with those of the counselor. They also come to counseling with a state of knowledge about the risk of having a child with a defect, the burden it represents, the genetic and biological principles underlying the defect and the basis for computing risk. Further, in their own family decision-making experience they may make great or little use of probabilities in coming to decisions. The family also comes with a set of values or attitudes regarding what they want as individuals and as members of a family unit, and these values also determine the kind of information they seek and how they use the information. Families will vary even with regard to the number of sources of information they use, so that for some, the genetic counselor may be the principal source, while for others, the genetic counselor may be one among many.

The counseling session represents an interaction between these two parties and no matter what the prior expectations on either side, the event may differ from what the two parties believe will happen, and after the event, what they think happened. Thus, the event itself must be studied and compared both with prior expectations and with post-counseling recollections. Did the counselor consciously or unconsciously break his stance of neutrality, and was it noted by the family? Was the family so immersed in absorbing the information about burden and prognosis that they recollected little about the risk information given by the counselor?

The expectations of both parties in genetic counseling provides two measures of effectiveness of counseling, rather than the single measure (goals of the counselor) which has been used up to now. Information obtained prior to counseling about the values, knowledge, and decision states of the family, as well as their expectations may enable the counselor to satisfy both his and the family's expectations.

An ideal design for answering the basic questions regarding genetic counseling should satisfy the canons of experimental design even though the issues are basically behavioral and social. The study would be prospective in that it measures the status of the parties before the counseling takes place and then measures changes following counseling, against the pre-counseling base (6). It should randomly assign counselees to varying types of counselors (such as a physician or a social worker), and to counselors who have different types of information available to them about the family before counseling. Finally, control groups should be utilized to control for both the effects of the research contacts on the family, as well as a control group which does not receive genetic counseling, but may also make decisions about having children.

#### B. SPECIFIC AIMS

1. To test the hypothesis that genetic counseling can be done at least as effectively by a social worker with some

training in clinical genetics as by an M.D. trained in clinical genetics.

2. To test the hypothesis that genetic counselors, even when holding consciously to the principle of "neutrality," will divulge their "true" feelings to their counselees.

3. To test the hypothesis that counselors who are informed prior to counseling regarding the values, knowledge, decision status and counseling expectations of the counselees will be more effective than counselors who are not so informed.

4. To develop measures for determining the effectiveness of genetic counseling which utilize the goals of the counselees, as well as the objectives of the counselors.

5. To learn how families utilize information provided in genetic counseling (such as risk and burden) in reaching decisions about child bearing.

### C. STUDY DESIGN

Four experimental groups and 3 control groups will be established in order to test the significance of the major variables in the study. All four of the experimental groups will be subject to the following procedures.

1. 48-72 hours, pre-counseling. Family receives pre-counseling interview by 2 members of research team and fills out inventory instruments to assess their values relating to child-bearing, family relationships and life expectations; their knowledge of probabilities, genetics and the disease or condition about which they are seeking counseling; the family decisions they have recently made or are in the process of making; and their expectations regarding the counseling they are to receive.

2. 24-48 hours pre-counseling. Genetic counselor writes a summary of his understanding of the case; his expectations regarding the session; the position he expects to take with the family (neutral, optimistic, pessimistic), and his personal feelings about the decision the family ought to make.

3. Family receives genetic counseling. The entire interview is audio-taped for analysis of the structure and content of the interaction.

4. 24-48 hours post-counseling. Summary and evaluation of the counseling session by the genetic counselor including his prediction about the decision the family will make and differences between his expectations recorded at point #2 and what actually occurred during the counseling at point #3.

5. 48-72 hours post-counseling. Interview and administration of instruments to the family, similar to point #1. Probes on: their view of the counseling session; what they learned; were

expectations met; what position did they feel the counselor took.

6. 1 month post-counseling interview with family.  
Information obtained as at #1; probes on other information obtained by family sources of information, new experiences which have led to value changes and decisions.

7. 6 month post-counseling interview with family.  
Information obtained as in #6.

8. 1 year post-counseling interview with family.  
Information obtained as in #6.

The 4 experimental groups will vary according to whether they receive counseling by an M.D. trained in medical genetics or by a social worker trained in genetic counseling. They will also vary according to whether the counselor receives or does not receive information about the family obtained from the pre-counseling contact (point #1, above). The families in all 4 of the experimental groups defined below will be subject to the procedures outlined above (#1-8).

Families seeking or referred for genetic counseling will be assigned randomly to one of the following treatment groups:

- Group E-1. Receives counseling from M.D. trained in medical genetics. Counselor receives no information obtained from pre-counseling interview.
- Group E-2. Receives counseling from M.D. trained in medical genetics. Counselor receives information about the family obtained in pre-counseling research interview.
- Group E-3. Receives counseling from social worker trained in genetic counseling. Counselor receives no information obtained from pre-counseling research interview.
- Group E-4. Receives counseling from social worker trained in genetic counseling. Counselor receives information about the family obtained in pre-counseling research interview.

It has been our experience with other longitudinal studies (12) that multiple interviews with families in order to obtain research data actually provide considerable psychological and social support for the family. In the case of the proposed study, it could even influence the decision made by the family by helping them to focus on the problems they face and to make more explicit the alternatives they may have. In order to control for the effects of the interviews and instruments on the decisions that may be made by the families, the following 2 control groups will be established by random assignment of families:

Group C-1. Family does not receive pre-counseling research interview (#1 above). Receives counseling from M.D. trained in medical genetics (as does Group E-1). Counselor completes pre- and post-counseling summary (points #2 and #4). Family does not receive post-counseling follow-up (points #5, #6, and #7) until 1 year post-counseling (point #8).

Group C-2. Family does not receive pre-counseling research interview (#1 above). Receives counseling from social worker trained in genetic counseling (as does Group E-3). Counselor completes pre- and post-counseling summary (points #2 and #4). Family does not receive post-counseling follow-up (points #5, #6, and #7) until 1 year post-counseling (point #8).

A third control group (C-3) will consist of parents who have a child with a chronic, non-genetic condition and who have not received genetic counseling. This group will provide an overall control on the effect of genetic counseling on family decisions, particularly with regard to knowledge and limitation of family size. Like control groups C-1 and C-2 they will be interviewed one year after receiving information from a physician (in this case, information about the diagnosis and prognosis for their child).

#### ENTRANCE CRITERIA FOR THE STUDY

For families in the 4 experimental groups and families in control groups 1 and 2:

1. Family must seek or be referred for and receive genetic counseling at Stanford University Medical Center.
2. Family must be intact, i.e. there must be a couple in an already-established marriage or common-law relationship.
3. Family must be willing to participate in the number of sessions involved for data collection. Counseling costs and transportation for research interviews will be borne by the project to encourage participation.

Families in control group 3 will meet the same criteria, except that they will have a child with a non-genetic, chronic condition diagnosed at Stanford University Medical Center or the Children's Hospital at Stanford.

The purpose of the entrance criteria is to control for some of the background variables which must be considered in data analysis. Patients receiving genetic counseling outside of the medical center must be presumed to be a population with somewhat different characteristics than the population seen at the medical center, and the counseling they receive must also be assumed to be somewhat different. A population outside of the medical center

could be studied only by increasing the size of the study population by 100%. Use of a medical center population, combined with the requirement that families be intact, will serve to provide a population with some homogeneity with regard to income, education, occupation and family situation (13). This requirement, for example, rules out from the study couples seeking genetic counseling before marriage, unmarried teen-age mothers, etc. While the impact of counseling on these groups is deserving of study, given the number of variables in the study, control of some of the population characteristics is necessary. These criteria will also allow for random assignment of families to treatment and control groups thus obviating the difficulties and possible bias of selective matching.

#### INSTRUMENTS AND SCHEDULING

The first year of the study will be devoted to the development and validation of the instruments to be utilized, the training of personnel to do the coding of the transcripts of the counseling and interview sessions, and a pilot test of the study design. Approximately 50 families will be utilized during the first year. During the second and third year of study, approximately 125 families will be taken in and followed each year. The 4th year will be devoted to continued one year post-counseling follow-up of the families and data analysis. The 5th year will be exclusively data analysis and write-up of the study.

Among the instruments to be developed are those to assess the attitudes, decision state, knowledge and expectations of families relevant to genetic counseling. These are the instruments to be utilized at point #1 in the study design and at future follow-up points. These instruments will be pre-tested with a variety of patients to determine their ability to distinguish significant differences among families, their ease of administration and numerical scoring. Face validity will be determined through use of standard pre-test procedures (14). Particular attention will be given to the development of instruments which will determine the ability of the families to apply probability figures to every-day life situations.

During the development period, genetic counseling sessions will be tape recorded and a scoring system developed for analysis of the sessions. Coders, who will have no knowledge of the pre-counseling data obtained from the families or the counselors, will apply the scoring system. Using an adaptation of the interaction methods developed by Bales (15), both the structure and the content of the sessions will be analyzed. These data will be tested against the pre-counseling data obtained from both the counselors and families and against the recall, post-counseling, of counselors and families.

Pre-coded and pre- and post-counseling forms to be used by the counselors will be developed. Counselors will record their understanding of the case, the stance they propose to take and



their own personal feelings about the decision the family should make. The standardized post-counseling report will include their evaluation of the session, any changes from the pre-counseling stance and their estimate of the decision the family might make as a result of the counseling. The expectations of the counselor regarding the session will be compared with the pre-counseling expectations elicited independently from the couple. Similarly, the post-counseling summary from the counselor will be compared with the post-counseling view of the session obtained from the counselees.

Post-counseling interviews will also be conducted with the families (points #5-8 in the study design). Some of the same pre-counseling instruments will be used along with a standard interview format combining general and specific probe questions similar in form to the type developed by the study director for a study of family response to the birth of premature infants (12, 13). Included in the post-counseling interviews will be questions to elicit family reactions to the counseling, their assessment of the point of view taken by the counselor, decisions they may have reached and the reasons for making the decisions they have arrived at. On the basis of our previous family studies, the husband and wife will be interviewed separately to prevent contamination of the decision-making process by forcing consensus or facilitating husband-wife communication. Since the pre-counseling assessment will also be obtained independently, one form of data analysis will be to see to what extent the values and information of the husband and wife coincide after counseling.

The timing of data collection for the post-counseling period, beyond the first post-counseling interviews, is not rigidly established. One purpose of the first year of developmental work is to determine the best timing that will take us closest to the point at which families do make decisions.

#### LIMITATIONS

There may be some loss of subjects to follow-up, but this will be minimized by paying transportation and counseling costs. The number of families who refuse to participate in the study will be kept to a minimum through the same devices, but background data will be obtained in any case to see whether refusing families differ in important respects from the study population.

The findings of the study will not apply, of course, to couples who seek pre-marital counseling, to individuals who do not constitute a family unit, and to those who do not seek or are referred for counseling. Further, it is anticipated that because of the nature of the entrance criteria, the population will have fairly homogeneous middle class characteristics (as defined by income, occupation and education).

A number of genetic counseling studies have attempted to determine the relationship between the decisions families make about reproduction and the risk and burden they face. As noted previously, the meaning of risk from the family's point of view has not been determined. Further, there appear to be significant differences among counselors regarding the nature of the burden for the same disease. Therefore, we have not chosen to classify families on the basis of risk and burden before assigning them to the experimental or control groups. Risk and burden will be analytic variables in the study and random assignment of families should provide an appropriate mix of these variables in each group.

#### SIGNIFICANCE

The study will provide the first systematic test of the significant questions relating to the practice and impact of genetic counseling. The study is unique in the experimental nature of the design. The instruments to be developed in the course of the study should be useful to counselors in guiding their practices and in evaluation of their effectiveness. Conceptually, the study places genetic counseling within the general framework of family decisions, so that the effect of variables other than counseling on decision-making can be assessed.

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14. Festinger, L., Katz, D.: Research Methods in the Behavioral Sciences. Holt, Rinehart & Winston, N.Y., 1953.
15. Bales, R.F.: Interaction Process Analysis: A Method for the Study of Small Groups. Addison Wesley, Reading, Mass., 1950.

SUBSTITUTE DETAILED BUDGET FOR FIRST 12-MONTH PERIOD		PERIOD COVERED		GRANT NUMBER
		FROM 1/1/74	THROUGH 12/31/74	
1. PERSONNEL (List all personnel engaged on project)		TIME OR EFFORT %/HRS.	AMOUNT REQUESTED (Omit cents)	
NAME (Last, first, initial)	TITLE OF POSITION		TOTAL	
Barnett, C.	Principal Investigator or Program Director	20%	IMPACT OF GENETIC COUNSELING PRACTICES	
Cann, H.,	Assoc. Prof./Peds.	10%		
Luzzatti, L.	Professor of Peds.	10%		
Open	Research Assoc.-Stat	20%		
Open-Pediatrics	Res. Assoc.-Soc. wk.	50%		
Open-Pediatrics	Interviewer	50%		
Open-Pediatrics	Interviewer	25%		
Open-Pediatrics	Statistical Clerk	50%		
Open-Pediatrics	Data Coder	65%		
Open-Pediatrics	Typist	100%		
TOTAL			\$ 47,377	
2. CONSULTANT COSTS (Include Fees and Travel)			\$	
3. EQUIPMENT (Itemize)				
Tape Recorder			\$ 500 *	
4. SUPPLIES			\$	
5. STAFF TRAVEL (See Instructions)	a. DOMESTIC 1 East coast meeting		\$ 500	
	b. FOREIGN		\$	
6. PATIENT COSTS (Separate Inpatient and Outpatient)				
Genetic counseling			\$ 2,500	
7. ALTERATIONS AND RENOVATIONS			\$	
8. OTHER EXPENSES (Itemize per instructions)				
Office supplies, telephone, repro., postage, publication costs, etc. 1200				
Central computer usage 1200			\$ 2,400	
9. Subtotal - Items 1 thru 8			\$ 53,277	
FOR TRAINING GRANTS ONLY	10. TRAINEE EXPENSES (See Instructions)			
	a. STIPENDS	PREDOCTORAL No. Proposed	\$	
		POSTDOCTORAL No. Proposed	\$	
		OTHER (Specify) No. Proposed	\$	
		DEPENDENCY ALLOWANCE	\$	
	TOTAL STIPEND EXPENSES		\$	
	b. TUITION AND FEES		\$	
c. TRAINEE TRAVEL (Describe)		\$		
11. Subtotal - Trainee Expenses		\$		
12. TOTAL DIRECT COST (Add Subtotals, Items 9 and 11, and enter on Page 1)			\$ 53,277	

**BUDGET ESTIMATES FOR ALL YEARS OF SUPPORT REQUESTED FROM PUBLIC HEALTH SERVICE  
DIRECT COSTS ONLY (Omit Cents)**

DESCRIPTION		1ST PERIOD (SAME AS DE- TAILED BUDGET)	ADDITIONAL YEARS SUPPORT REQUESTED <i>(This application only)</i>					
			2ND YEAR	3RD YEAR	4TH YEAR	5TH YEAR	6TH YEAR	7TH YEAR
PERSONNEL COSTS		47,377	50,732	54,229	57,964	61,950		
CONSULTANT COSTS <i>(Include fees, travel, etc.)</i>								
EQUIPMENT		500*						
SUPPLIES								
TRAVEL	DOMESTIC	500	600	600	600	700		
	FOREIGN							
PATIENT COSTS		2,500	5,000	5,000				
ALTERATIONS AND RENOVATIONS								
OTHER EXPENSES		2,400	2,600	2,800	3,000	3,200		
TOTAL DIRECT COSTS		53,277	58,932	62,629	61,564	65,850		
TOTAL FOR ENTIRE PROPOSED PROJECT PERIOD <i>(Enter on Page 1, Item 4)</i> →						\$ 302,252		

REMARKS: Justify all costs for the first year for which the need may not be obvious. For future years, justify equipment costs, as well as any significant increases in any other category. If a recurring annual increase in personnel costs is requested, give percentage. (Use continuation page if needed.)

Budget explanation attached

## BUDGET EXPLANATION

Dr. Barnett has a 9 month academic appointment supported jointly by the Department of Pediatrics and the Department of Anthropology. His project salary is computed on the basis of 10% time during the 9 month academic year and 70% time during July and August for an average of approximately 20% during each year.

The social worker (50% time), a research associate (20% time), two interviewers (50% and 25% time respectively), a statistical clerk (50% time), a data coder (65% time) and a typist (100% time) are required for the project. Two interviewers are required because husband and wife will be seen separately. The research associate is a biomathematician experienced in design of and data analysis for behavioral research projects. Computer time will be used for data analysis.

Salaries are increased at a rate of 6% per year to cover merit and cost of living increases. Staff benefits are applied based on the following University projections: 17%, 9/73-8/74; 18.3%, 9/74-8/75; 19.3%, 9/75-8/76; 20.3%, 9/76-8/77; 21.3%, 9/77-8/78; and 22.3%, 9/78-8/79.

The tape recorder will be used by the typist to transcribe tape recordings of genetic counseling sessions and pre- and post-counseling interviews in the project on genetic counseling impacts on the family.

To insure that we obtain adequate patient material for the project on genetic counseling, we propose to waive the fee for this service to any participating family and therefore include these costs in our budget. The cost of genetic counseling to a family is \$50. This does not include laboratory tests and amniocentesis. We anticipate doubling the number of patients in the second and third years of the project. In years 4 and 5 no new patients will be studied although follow-up interviews will be carried out for those studied in year 3.

## SECTION VII

### Overall Budgets

## DIRECTOR'S OFFICE BUDGET EXPLANATION

Salary support for the Program Director (Professor Lederberg) has been included entirely under the subproject budget for Screening and Characterization of Inborn Errors of Metabolism Using GC/MS. The 20% of his time budgetted there, includes support for his role in overall program direction as well as his direct involvement in that research project. This 20% allocation has not been subdivided between that budget and the present Program Director's Office budget. Such a suballocation would be difficult to make realistically since the apportionment of Professor Lederberg's time will vary from time to time, depending on program needs.

This budget does include support for 30% of the Program Director's secretary. She will support the Director in overall program management as well as in liaison work with the Visiting Committee and in implementing the planned annual symposium on aspects of genetic disease. An important responsibility of the Director is maintaining current awareness of the relevant literature which spans a number of fields. Ms. Redse will spend considerable time in assisting at this task with the help of modern information services and devices. She will also undertake to disseminate notices to the appropriate collaborating investigators.

Ms. Redse's salary is increased at a rate of 6% per year to cover merit and cost of living increases. Staff benefits are applied based on the following University projections: 17%, 9/73-8/74; 18.3%, 9/74-8/75; 19.3%, 9/75-8/76; 20.3%, 9/76-8/77; 21.3%, 9/77-8/78; and 22.3%, 9/78-8/79.

Secretarial support for the individual Principal Investigators is provided in those respective subproject budgets.

The budget also covers estimated expenses for Visiting Committee honoraria and travel and expenses related to the planned annual symposia.



SUBSTITUTE DETAILED BUDGET FOR FIRST 12-MONTH PERIOD		PERIOD COVERED		GRANT NUMBER		
		FROM	THROUGH			
1. PERSONNEL <i>(List all personnel engaged on project)</i>		TIME OR EFFORT	AMOUNT REQUESTED <i>(Omit cents)</i>			
NAME <i>(Last, first, initial)</i>	TITLE OF POSITION	%/HRS.	TOTAL			
Redse, R.	Principal Investigator or Program Director	30	PROGRAM DIRECTOR'S OFFICE			
	Program Director's Secretary					
TOTAL →			\$ 3,414			
2. CONSULTANT COSTS <i>(Include Fees and Travel)</i>			\$ -			
3. EQUIPMENT <i>(Itemize)</i>			\$ -			
4. SUPPLIES			\$ -			
5. STAFF TRAVEL <i>(See Instructions)</i>			\$ -			
			\$ -			
6. PATIENT COSTS <i>(Separate Inpatient and Outpatient)</i>			\$ -			
7. ALTERATIONS AND RENOVATIONS			\$ -			
8. OTHER EXPENSES <i>(Itemize per instructions)</i>			\$ 5,000			
Visiting Committee honoraria and travel and expenses for annual symposium. Communications: information services (e.g., abstracts, ASCA; MEDLINE).						
9. Subtotal - Items 1 thru 8 →			\$ 8,414			
FOR TRAINING GRANTS ONLY	10. TRAINEE EXPENSES <i>(See Instructions)</i>					
	a. STIPENDS	PREDOCTORAL			No. Proposed _____	\$
		POSTDOCTORAL			No. Proposed _____	\$
		OTHER <i>(Specify)</i>			No. Proposed _____	\$
	DEPENDENCY ALLOWANCE			\$		
	TOTAL STIPEND EXPENSES →		\$			
	b. TUITION AND FEES		\$			
c. TRAINEE TRAVEL <i>(Describe)</i>		\$				
11. Subtotal - Trainee Expenses →		\$				
12. TOTAL DIRECT COST <i>(Add Subtotals, Items 9 and 11, and enter on Page 1)</i>			\$ 8,414			